DISCLAIMER: These Standard Operating Procedures (SOP's) are for the exclusive use of Navy Public Works Center (PWC) Norfolk. They are promulgated as guidance for their NAVFAC Commands. If intended to be used by other activities, they must be tailored to each activity's particular requirements and must be reviewed/approved by the activity's safety professionals prior to use.

NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

REPLACE PRIMARY FUSED OIL SWITCH, 34.5 KV IFLDR TYPE

PROCEDURE NUMBER

WC 624 HVE 061

SIGNED:_____

(DATE)

APPROVED:_____

(DATE)

SAFETY PROFESSIONAL:_____

(DATE)

MANAGEMENT OFFICIAL:_____

(DATE)

REVISION A

REPLACE PRIMARY FUSED OIL SWITCH
34.5 KV IFLDR TYPE

DISTRIBUTION

CODE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE
601.C3							
620							
622							
610.E1							
622.3							

REPLACE PRIMARY FUSED OIL SWITCH
34.5 KV IFLDR TYPE

REVISIONS

REV	DESCRIPTION	SIGNATURE	DATE
A	Initial Issue.		

REPLACE PRIMARY FUSED OIL SWITCH
34.5 KV IFLDR TYPE

Purpose:
Procedure to replace a 34.5 kv fused oil switch.

Potential Energy Sources:
1. 34.5 kv cables and equipment.
2. Generators if installed at facilities to provide temporary power during the transformer change out.

Tools and PPE:
Tools: Auger truck, certified slings, chain hoists, machine casters, machine roll bars, rope, hand tools, high voltage tester, Multimeter, and phase rotation meter. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, and back brace if required by back injury prevention and control program. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class 1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

References:
1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
3. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.
4. SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck
5. SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
6. SOP WC 622 HVE 007, Switchout And Switchback Energized Circuit

Procedures:
1. Check the facility's phase rotation with a phase rotation meter prior to operations personnel's outage switching. If the facility's power voltage is less than 300 volts, wear Nomex coveralls, safety shoes, and hard hat and avoid contact with energized components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves.

2. Operations personnel will deenergize the primary circuit per SOPs
   a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
   b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

Operations personnel will ensure that the facility's emergency generator or temporary power generator, if present, is isolated and will not back feed to the transformer.

3. Using a high voltage tester test the primary circuit's cables to verify they are deenergized. Before the conductors are checked, test the high voltage tester on a known energized circuit of same voltage to verify the tester is working. Test each deenergized conductor separately, taking care not to cross phase during test. If voltage is detected, stop the test and (a) notify operations

personnel that the circuit is still energized, (b) wait for operations personnel to correct the problem, (c) perform the deenergization verification test once again after operations personnel finish switching operations and declare the cables deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat while testing.

If the primary circuit's cables can not be accessed, then go to another transformer site on the same circuit, which has accessible conductors, and perform the deenergization verification test there.

The PPE for the repair work will include work gloves, safety shoes(oil resistant), safety glasses, and hard hats. Refer to the JHA for further information.

4. Drain the oil from the switch and throat section. Place oil into clean, dry, 55 gallon drums. Cover the drums tightly during the repair work.

5. Unbolt and remove top from switch.

6. Remove the flex cables from the line and load side switch terminators.

7. Unbolt the terminators and remove them. Take care to not exceed the bending radius of the cable or damage the terminator.

8. Disconnect the case ground.

9. Set up auger truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details.

Outdoor Installation

10. Remove the bolts connecting the switch to the transformer(or other cabinet). Remove nut from the anchor bolts securing the unit to the concrete pad. Using a certified sling, attach the switch to the auger truck's boom winch. Lift and remove the switch. Set the switch on the stake body truck for transporting to storage/disposal site.

11. Using a certified sling, attach the new switch to the auger truck's boom winch. Lift and set the new switch in place.

a) Install flange gasket.

b) Align bolt holes and secure switch to transformer(or other cabinet) vie bolts, nuts, and washers.

c) Shim the footings as required to level the device, and tighten down the anchor bolt nuts to secure the switch to the pad.

Indoor Installation

10. Remove the bolts connecting the switch to the transformer(or other cabinet). Remove nut from the anchor bolts(if present) securing the unit to the floor. Using chain hoists, machine casters, machine roller bars, rope, Auger truck with certified sling, etc., move the switch outside

the facility. Using a certified sling, attach the switch to the auger truck's boom winch. Lift and set the switch on the stake body truck for transporting to storage/disposal site.

11. Using a certified sling, attach the new switch to the auger truck's boom winch. Lift and set the new switch close to, or inside the facility door. Using chain hoists, machine casters, machine roller bars, rope, Auger truck with certified sling, etc., put the new switch in place.

a) Install flange gasket.

b) Align bolt holes and secure switch to transformer(or other cabinet) vie bolts, nuts, and washers.

c) Shim the footings as required to level the device, and tighten down the anchor bolt nuts to secure the switch to the pad.

12. Reconnect the cables to the switch.

a) Install the terminators and their gaskets.

b) Install the flex jumpers to the line and load side switch terminators.

c) Torque all nuts and bolts to manufacture's specifications.

13. Ensure the switch tank's interior is clean.

14. Take fuses from replaced switch and put in the new switch.

15. Install the switch top and it's gasket. Torque all fastening nuts and bolts to manufacture's specifications.

16. Using an oil filtering pump, pump oil back into device. If the existing oil is visually in poor condition, black or brown color and sludge present, then pump in new oil.

a) Connect pump/filter and hose assembly to device's bottom drain valve.

b) Turn pump on and open the device's drain valve's test port. Pump oil into a container till no air bubbles are present in the oil stream. At this point close the test port; open the drain valve and fill the tank to the proper level.

17. Obtain a sample of the oil and test it's dielectric strength.

a) Pumping existing oil - If the oil tests greater than 25 kv proceed with procedures. If the oil tests below 25 kv, then oil has to be filtered and retested till the 25 kv point is reached. If 25 kv can not be obtained, replace the existing oil. Follow new oil procedure below.

b) Pumping new oil - Test the new oil prior to placing in the device. If the oil is less than 30 kv obtain another batch of oil. Test the new oil after it has been placed in the device. If the oil tests below 30 kv, then oil has to be filtered and retested till the 30 kv point is reached.

18. Following Steps 16-17 fill switch's throat section with insulating oil.

19. Settling time - If air has been introduced into the switch's insulating oil

by (a) not following the pumping procedure, (b) air bubbles in the oil stream, (c) air pumped into oil due to emptying the new oil container, (d) oil has been through a filter operation, then the switch will have to have a settling time of 8 hours. The settling time can be reduced to 1 hour by placing a vacuum in the oil tank. Do not exceed the tank's pressure strength. If this is not known then a 5 psig vacuum should be used.

20. Place a vacuum in the device's tank, if not already done, and install a 3 psig Nitrogen blanket over the tank's oil surface.

21. Inspect the switch to ensure there are no oil or termination leaks.

22. Operations personnel will remove grounds and reenergize the circuit in order to allow testing of the facility's voltage and phase rotation. Operations personnel will follow SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout).

23. Check the secondary voltage and phase rotation with a phase rotation meter and compare this with the check performed prior to the transformer change out. Wear PPE per Step 1.

If the rotation has reversed, operations personnel will deenergize the circuit and attach grounds once again as per SOP WC 622 HVE 013. After the unit is deenergized, exchange two connections of the switch. Operations personnel will then remove grounds and reenergize the unit and the phase rotation can be checked once again.

If Step 1 of this procedure was not done, then to check the rotation, locate a 3 phase motor to verify it's rotation is correct.

If the phase rotation is correct proceed to Step 24.

24. Operations personnel will energize the primary circuit and transformer per SOPs
    a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
    b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

END